UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,125	02/14/2005	Johan O. A. Robertsson	2088.006300/14.0198PCTUS	5567

28116   7590   08/09/2007

WESTERNGECO L.L.C.
10001 RICHMOND AVENUE
(P.O. BOX 2469, HOUSTON, TX 77252-2469, U.S.A.)
HOUSTON, TX 77042

EXAMINER
HUGHES, SCOTT A

ART UNIT	PAPER NUMBER
3663	

MAIL DATE	DELIVERY MODE
08/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/501,125	ROBERTSSON, JOHAN O. A.
	Examiner	Art Unit	
	Scott A. Hughes	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *7/10/2007*.

2a) ☒ This action is **FINAL**.　　2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-23* is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-23* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>08 July 2004</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☒ All　b)☐ Some * c)☐ None of:

　　　1. ☒ Certified copies of the priority documents have been received.

　　　2. ☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date *2/21/2007, 7/10/2007*.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 5/23/2007 have been fully considered but they are not persuasive.

Applicant argues that the Yan 2001 reference is not prior art. Applicant argues that in order to be prior art, the Yan reference must have been published or disclosed to the public in the period of Jan. 1-10, 2001. This argument is only true if the Yan reference was applied as a 102 (b) reference, requiring that the reference be published more than a year before applicant's priority date of Jan. 11, 2002. Since the reference is prior art as defined under 102 (a) and used in rejections under 35 USC 103 (a), this argument is not persuasive. Applicant argues that the office has failed to provide any month or day of publication, and that the office does not dispute this fact and has failed to even address it in the last Office Action. This argument is not persuasive, as the argument was disputed and addressed in detail in the Response to Arguments of the Final Office Action dated 8/25/2006.

Applicant argues that the Yan 2001 reference does not detect the direct arrival from a down-going component of the wavefield. This argument is not persuasive, as the Yan reference discloses using either the pressure or particle velocity (parameters) to determine the down-going wavefield, and using the recorded pressure or particle velocity signals to identify the direct arrival. Yan uses the down-going pressure or particle velocity components to find the direct arrival, and therefore reads on applicant's

claim limitations. The direct arrivals identified in Yan are from the down-going data acquired.

Applicant argues that the Yan 2000 reference does not teach detecting a direct arrival of a downgoing wavefield from a parameter of the wavefield in a computer implemented method. This argument is not persuasive, as the Yan 2000 reference teaches finding the direct arrival of the downgoing wavefield by using the pressure of the wavefield (parameter) (Pages 5-9; see especially Figures and Numerical Examples). The acquired pressure and particle velocity data is used to find the upgoing and downgoing wavefields, and the direct arrivals are identified at certain times by using the pressure data of the downgoing wavefield components.

Information Disclosure Statement

The information disclosure statement filed 2/21/2007 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered.

Applicant's provide a translation of the short abstract of the document, but this translation of the abstract does not explain its relevance to the current application or point out which portions of the reference applicant believes are relevant.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6, 8-11, 15-18, and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yan (CREWES 2001) in view of Corrigan (5696734).

With regard to claim 1, Yan discloses a method of processing acoustic data acquired at a receiver (abstract). Yan discloses processing the acoustic data to obtain at least a down-going component of a parameter of the acquired acoustic data (Pages 322, 334-338, 341) (Figs. 14-17, 23). Yan discloses using at least down-going component of the parameter to identify the direct arrival at the receiver of acoustic energy emitted by a source (Pages 322, 334-338, 341) (Figs. 14-17, 23). Yan discloses that the down-going wavefield contains the direct arrival, and shows its detection with the down-going components in Fig. 23. Yan shows identifying the direct arrival (from breaks) after processing the acoustic data to obtain information about a parameter of the acoustic log (pressure related to time acquired by receivers) in Figs. 14-17. Yan does not specifically disclose that the process shown in the figures and described in the paper is done by a computer. Corrigan teaches that data analysis of marine seismic data including pressure data and particle motion data is done using a computer system

which collects data from all sensors and analyzes the data according to a method of

data analysis (abstract; Columns 5-6) (Fig. 4). It would have been obvious to modify

Yan to include using a computer system to implement the data collection and analysis

of the method described as taught by Corrigan in order to have a device to process all

of the data and store the results for further analysis or retrieval.

With regard to claim 2, Yan discloses identifying, in the down-going component

of the parameter, the direct arrival of acoustic energy emitted by a source (Pages 322,

334-338, 341) (Figs. 14-17, 23).

With regard to claim 3, Yan discloses that the parameter of acoustic data is

pressure (321, Introduction to 322; 334-338; 341) (Figs. 14-17, 23).

With regard to claim 4, Yan discloses determining the down-going component of

the pressure from the pressure acquired at the receiver and from either the vertical

component of the particle motion acquired at the receiver or the vertical component of

the pressure gradient acquired at the receiver (321, Introduction to 322; 334-338, 341)

(Fig. 23). Yan discloses using pressure and vertical component of particle motion

(velocity) to separate the wavefield into up-going and down-doing waves.

With regard to claim 5, Yan discloses that the parameter of acoustic data is the

vertical component of particle motion acquired at the receiver (321, Introduction to 322;

327-329; 341) (Figs. 14-17; 23). Yan discloses using pressure and vertical component

of particle motion (velocity) to separate the wavefield into up-going and down-doing

waves.

With regard to claim 6, Yan discloses determining the down-going component of the vertical component of particle motion from the pressure acquired at the receiver and from either the vertical component of the particle motion acquired at the receiver or the vertical component of the pressure gradient acquired at the receiver (321, Introduction to 322; 327-329; 341) (Figs. 14-17, 23). Yan discloses using pressure and vertical component of particle motion (velocity) to separate the wavefield into up-going and down-doing waves.

With regard to claim 8, Yan discloses that the vertical component of particle motion is the vertical component of particle velocity (321, Introduction to 322; 327-329; 341).

With regard to claim 9, Yan discloses that the step of determining the down-going component of the pressure comprises determining P^D as defined by the applicant (322; equations 1,2).

With regard to claim 10, Yan discloses processing at least the down-going component of the parameter of the acoustic data thereby to derive a further parameter of the acoustic data, and identifying in the further parameter, the direct arrival at the receiver of acoustic energy emitted at a source (321, Introduction to 322; 327-329; 341) (Figs. 14-17, 23). Yan discloses identifying the direct arrival wavefield in the down-going wavefield (341).

With regard to claim 11, Yan discloses that the further parameter is the direct arrival wavefield (321, Introduction to 322; 327-329; 341) (Figs. 14-17, 23).

With regard to claim 15, Yan discloses a method of seismic surveying (abstract). Yan discloses actuating a source of acoustic energy to emit acoustic energy, acquiring acoustic data at a receiver (Figs. 14-17, 23-24), and processing the acoustic data according to a method defined in claim 1 (321, Introduction to 322; 327-329; 341).

With regard to claim 16, Yan discloses an apparatus for processing acoustic data acquired at a receiver (abstract). Yan discloses means for processing the acoustic data to obtain at least a down-going component of a parameter of the acoustic data (Page (Pages 322, 334-338, 341) (Figs. 14-17, 23). Yan discloses a means for identifying the direct arrival at the receiver of acoustic energy emitted by a source, using at least the down-going component of the parameter (Pages 322, 334-338, 341) (Figs. 14-17, 23). Yan discloses that the down-going wavefield contains the direct arrival, and shows its detection with the down-going components in Fig. 23. Yan shows identifying the direct arrival (from breaks) after processing the acoustic data to obtain information about a parameter of the acoustic log (pressure related to time acquired by receivers) in Figs. 14-17. Yan does not specifically disclose the components of the apparatus or that it is a computing apparatus that is used in the data analysis. Corrigan teaches that data analysis of marine seismic data including pressure data and particle motion data is done using a computer system which collects data from all sensors and analyzes the data according to a method of data analysis (abstract; Columns 5-6) (Fig. 4). It would have been obvious to modify Yan to include using a computer system as the computing apparatus to implement the data collection and analysis of the method described as

taught by Corrigan in order to have a device to process all of the data and store the results for further analysis or retrieval.

With regard to claim 17, Yan discloses that the means for identifying the direct arrival are adapted to identify the direct arrival in the down-going component of the parameter (Pages 322, 334-338, 341) (Figs. 14-17, 23).

With regard to claim 18, Yan discloses means for processing at least the down-going component of the parameter of the acoustic data thereby to derive a further parameter of the acoustic data, and wherein the means for identifying the direct arrival are adapted to identify the direct arrival in the further parameter (321, Introduction to 322; 327-329; 341) (Figs. 14-17, 23). Yan discloses identifying the direct arrival wavefield in the down-going wavefield (341).

With regard to claim 20, Yan does not disclose a programmable data processor. From the references and the figures of the data obtained in the references, it is obvious that a computer was used. Yan does not specifically disclose a computer with a programmable data processor. Corrigan discloses a computer system including a programmable data processor for taking seismic data measurements and processing the data using ocean bottom hydrophones and geophones (Fig. 4) (abstract; Columns 5-6). It would have been obvious to modify Yan (CREWES 2000 or 2001) to include a computer with a programmable processor to process the data obtained by the hydrophones and geophones as taught by Corrigan in order to have a device to quickly and efficiently process the data and control the system.

With regard to claim 21, Yan does not disclose a storage medium containing a

program for the data processor of claim 20. Corrigan discloses a computer system

including a programmable data processor and a storage medium containing a program

(hard disk, floppy disk, magnetic tape) for taking seismic data measurements and

processing the data using ocean bottom hydrophones and geophones (Fig. 4) (abstract;

Columns 5-6). It would have been obvious to modify Yan (CREWES 2000 or 2001) to

include a computer with a programmable processor and storage medium containing a

program to process the data obtained by the hydrophones and geophones as taught by

Corrigan in order to have a device to quickly and efficiently process the data and control

the system.

With regard to claim 22, Yan discloses a seismic surveying apparatus comprising

a source of acoustic energy, a receiver spatially separated from the source, and an

apparatus as defined in claim 16 (321-322; 327-329; 341) (Figs. 14-17; 23-24).

With regard to claim 23, Yan discloses a ranging apparatus comprising a source

of acoustic energy, a receiver located proximate to the source (Figs. 23-24), and an

apparatus as defined in claim 16 (321-322; 327-329; 341) (Figs. 14-17, 23).

Claims 1-6, 8, 10-11, 15-18, and 20-23 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Yan (CREWES 2000) in view of Corrigan (5696734).

With regard to claim 1, Yan discloses a method of processing acoustic data

acquired at a receiver (abstract). Yan discloses processing the acoustic data to obtain

at least a down-going component of a parameter of the acquired acoustic data. Yan

discloses using at least down-going component of the parameter to identify the direct

arrival at the receiver of acoustic energy emitted by a source (Page 1, 4-6; Page 7,

Numerical Examples to Page 9) (Figs. 1-5). Yan discloses that the down-going

wavefield contains the direct arrival, and states the time of its detection compared to the

other down-going reverberations. Therefore, Yan uses the down-going component of

the pressure and particle velocity data to identify the direct arrival. The parameter from

which the down-going component is taken is the pressure and particle velocity. Yan

does not specifically disclose that the process shown in the figures and described in the

paper is done by a computer. Corrigan teaches that data analysis of marine seismic

data including pressure data and particle motion data is done using a computer system

which collects data from all sensors and analyzes the data according to a method of

data analysis (abstract; Columns 5-6) (Fig. 4). It would have been obvious to modify

Yan to include using a computer system to implement the data collection and analysis

of the method described as taught by Corrigan in order to have a device to process all

of the data and store the results for further analysis or retrieval.

With regard to claim 2, Yan discloses identifying, in the down-going component

of the parameter, the direct arrival of acoustic energy emitted by a source (Page 1, 4-6;

Page 7, Numerical Examples to Page 9) (Figs. 1-5). Yan discloses that the down-going

wavefield contains the direct arrival, and states the time of its detection compared to the

other down-going reverberations. Therefore, Yan uses the down-going component of

the pressure and particle velocity data to identify the direct arrival. The parameter from

which the down-going component is taken is the pressure and particle velocity.

With regard to claim 3, Yan discloses that the parameter of acoustic data is

pressure (Page 1, 4-6; Page 7, Numerical Examples to Page 9) (Figs. 1-5). Yan uses

the down-going component of the pressure and particle velocity data to identify the

direct arrival. The parameter from which the down-going component is taken is the

pressure and particle velocity.

With regard to claim 4, Yan discloses determining the down-going component of

the pressure from the pressure acquired at the receiver and from either the vertical

component of the particle motion acquired at the receiver or the vertical component of

the pressure gradient acquired at the receiver (Page 1, 4-6) (Figs. 1-5).

With regard to claim 5, Yan discloses that the parameter of acoustic data is the

vertical component of particle motion acquired at the receiver (Page 1, 4-6) (Figs. 1-5).

With regard to claim 6, Yan discloses determining the down-going component of

the vertical component of particle motion from the pressure acquired at the receiver and

from either the vertical component of the particle motion acquired at the receiver or the

vertical component of the pressure gradient acquired at the receiver (Page 1, 4-6) (Figs.

1-5).

With regard to claim 8, Yan discloses that the vertical component of particle

motion is the vertical component of particle velocity (Page 1, 4-6) (Figs. 1-5).

With regard to claim 10, Yan discloses processing at least the down-going

component of the parameter of the acoustic data thereby to derive a further parameter

of the acoustic data, and identifying in the further parameter, the direct arrival at the

receiver of acoustic energy emitted at a source (Page 1, 4-6) (Figs. 1-5). Yan discloses

finding the down-going wavefield, which contains the direct arrival wavefield.

With regard to claim 11, Yan discloses that the further parameter is the direct

arrival wavefield (Page 1, 4-6) (Figs. 1-5).

With regard to claim 15, Yan discloses a method of seismic surveying. Yan

discloses actuating a source of acoustic energy to emit acoustic energy, acquiring

acoustic data at a receiver, and processing the acoustic data according to a method

defined in claim 1.

With regard to claim 16, Yan discloses an apparatus for processing acoustic data

acquired at a receiver. Yan discloses means for processing the acoustic data to obtain

at least a down-going component of a parameter of the acoustic data. Yan discloses a

means for identifying the direct arrival at the receiver of acoustic energy emitted by a

source, using at least the down-going component of the parameter (Page 1, 4-6; Page

7, Numerical Examples to Page 9) (Figs. 1-5). Yan discloses that the down-going

wavefield contains the direct arrival, and states the time of its detection compared to the

other down-going reverberations. Therefore, Yan uses the down-going component of

the pressure and particle velocity data to identify the direct arrival. The parameter from

which the down-going component is taken is the pressure and particle velocity. Yan

does not specifically disclose the components of the apparatus or that it is a computing

apparatus that is used in the data analysis. Corrigan teaches that data analysis of

marine seismic data including pressure data and particle motion data is done using a

computer system which collects data from all sensors and analyzes the data according

to a method of data analysis (abstract; Columns 5-6) (Fig. 4). It would have been obvious to modify Yan to include using a computer system as the computing apparatus to implement the data collection and analysis of the method described as taught by Corrigan in order to have a device to process all of the data and store the results for further analysis or retrieval.

With regard to claim 17, Yan discloses that the means for identifying the direct arrival are adapted to identify the direct arrival in the down-going component of the parameter (Page 1, 4-6; Page 7, Numerical Examples to Page 9) (Figs. 1-5).

With regard to claim 18, Yan discloses means for processing at least the down-going component of the parameter of the acoustic data thereby to derive a further parameter of the acoustic data, and wherein the means for identifying the direct arrival are adapted to identify the direct arrival in the further parameter (Page 1, 4-6) (Figs. 1-5). Yan discloses finding the down-going wavefield, which contains the direct arrival wavefield.

With regard to claim 20, Yan does not disclose a programmable data processor. From the references and the figures of the data obtained in the references, it is obvious that a computer was used. Yan does not specifically disclose a computer with a programmable data processor. Corrigan discloses a computer system including a programmable data processor for taking seismic data measurements and processing the data using ocean bottom hydrophones and geophones (Fig. 4) (abstract; Columns 5-6). It would have been obvious to modify Yan (CREWES 2000 or 2001) to include a computer with a programmable processor to process the data obtained by the

hydrophones and geophones as taught by Corrigan in order to have a device to quickly and efficiently process the data and control the system.

With regard to claim 21, Yan does not disclose a storage medium containing a program for the data processor of claim 20. Corrigan discloses a computer system including a programmable data processor and a storage medium containing a program (hard disk, floppy disk, magnetic tape) for taking seismic data measurements and processing the data using ocean bottom hydrophones and geophones (Fig. 4) (abstract; Columns 5-6). It would have been obvious to modify Yan (CREWES 2000 or 2001) to include a computer with a programmable processor and storage medium containing a program to process the data obtained by the hydrophones and geophones as taught by Corrigan in order to have a device to quickly and efficiently process the data and control the system.

With regard to claim 22, Yan discloses a seismic surveying apparatus comprising a source of acoustic energy, a receiver spatially separated from the source, and an apparatus as defined in claim 16 (Page 1, 4-6; Page 7, Numerical Examples to Page 9) (Figs. 1-5).

With regard to claim 23, Yan discloses a ranging apparatus comprising a source of acoustic energy, a receiver located proximate to the source, and an apparatus as defined in claim 16 (Page 1, 4-6; Page 7, Numerical Examples to Page 9) (Figs. 1-5).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yan (CREWES 2001) in view of Corrigan as applied to claims 1-4 above.

With regard to claim 7, Yan discloses that the vertical component of particle motion is the vertical component of particle velocity, not particle acceleration. It is known that velocity is the time derivative of acceleration, and that both are measures of the particle motion. It would have been obvious to modify Yan to include using particle acceleration sensors (accelerometers) instead of particle velocity sensors as both are known and used in the art.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yan (CREWES 2000) in view of Corrigan as applied to claims 1-4 above.

With regard to claim 7, Yan discloses that the vertical component of particle motion is the vertical component of particle velocity, not particle acceleration. It is known that velocity is the time derivative of acceleration, and that both are measures of the particle motion. It would have been obvious to modify Yan to include using particle acceleration sensors (accelerometers) instead of particle velocity sensors as both are known and used in the art.

Claims 12-14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yan (CREWES 2001 or CREWES 2000) in view of Corrigan as applied to claims 1 and 16 above, and further in view of Monk.

With regard to claim 12, neither Yan reference discloses determining the path length of acoustic energy from the source to the receiver from the direct arrival of acoustic energy at the receiver. Monk teaches a method of analyzing seismic data

involving separating up-going and down-going wavefields (Columns 1-2). Monk

teaches that the travel times of the detected waves from the source to the receivers can

be used to determine distances (Column 1, Lines 50-65). It would have been obvious to

modify Yan (CREWES 2000 or 2001) to include using the travel times of the direct

arrival waves to determine distances (path length of the wave) to the receivers in order

to be able to determine the geometry of the subsurface structures from the pathlengths

of the waves and the locations of the receivers from the source (pathlength of direct

wave to travel from source to receiver).

    With regard to claim 13, neither Yan reference discloses that the source is

spatially separated from the receiver, and that the path length of seismic energy from

the source to the receiver is indicative of the separation between the source and the

receiver. Monk teaches that the travel times of the detected waves from the source to

the receivers can be used to determine distances (Column 1, Lines 50-65). It would

have been obvious to modify Yan (CREWES 200o or 2001) to include using the travel

times of the direct arrival waves to determine distances (path length of the wave) to the

receivers in order to be able to determine the geometry of the subsurface structures

from the pathlengths of the waves and the locations of the receivers from the source

(pathlength of direct wave to travel from source to receiver).

    With regard to claim 14, neither Yan reference discloses that the source is

proximate to the receiver, and that the path length of seismic energy from the source to

the receiver is indicative of the range from the source and receiver to a reflector of

acoustic energy. Monk teaches that the travel times of the detected waves from the

source to the receivers can be used to determine distances to reflectors in the subsurface (Column 1, Lines 50-65). It would have been obvious to modify Yan (CREWES 2000 or 2001) to include using the travel times of the direct arrival waves to determine distances (path length of the wave) to the receivers in order to be able to determine the geometry of the subsurface structures from the pathlengths of the waves and the locations of the receivers from the source (pathlength of direct wave to travel from source to receiver).

With regard to claim 19, neither Yan reference discloses means for determining the path length of acoustic energy from the source to the receiver from the direct arrival of acoustic energy at the receiver. Monk teaches that the travel times of the detected waves from the source to the receivers can be used to determine distances (Column 1, Lines 50-65). It would have been obvious to modify Yan (CREWES 2000 or 2001) to include using the travel times of the direct arrival waves to determine distances (path length of the wave) to the receivers in order to be able to determine the geometry of the subsurface structures from the pathlengths of the waves and the locations of the receivers from the source (pathlength of direct wave to travel from source to receiver).

Conclusion

The cited prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).
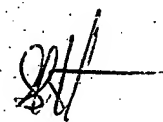
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A. Hughes whose telephone number is 571-272-6983. The examiner can normally be reached on M-F 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAH

JACK KEITH
SUPERVISORY PATENT EXAMINER